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ABSTRACT

An analytical technique from the field of market research called conjoint analysis was applied to a psychological measurement of student testing design preferences. Past concerns with testing design are reviewed, and a newer approach to testing is identified--the modified confidence weighted-admissible probability measurement (MCW-APM) test scoring method developed by J. Bruno (1985). The conjoint analysis approach was applied to measure student preferences for testing design. The conjoint design was developed with four factors: objectivity (subjective and objective), restrictions (restricted and unrestricted), partial credit (allowed and not allowed), and feedback (given and not given). Usable survey responses were received from 516 individuals from different levels of education and different colleges. To demonstrate the flexibility of conjoint analysis, the study design was modified to add a fifth factor of test-responding simplicity. The illustration indicates that conjoint analysis can be used for larger sample sizes and that it permits analysis by demographic factors, a feature that is applicable to education. Six tables present study data. A 12-item list of references is included. (SLD)

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A PSYCHOLOGICAL MEASUREMENT OF STUDENT TESTING DESIGN PREFERENCES

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ABSTRACT

This study describes an analytical technique from the field of market research called conjoint analysis applied to a psychological measurement of student testing design preferences. The study reviews past concerns with testing design and identifies a newer approach to testing: the modified confidence weighted-admissible probability measurement (MCW-APM) test scoring method developed by Bruno (1985). The conjoint analysis approach is applied to measure student preferences for testing design.

Introduction

Conjoint analysis is a technique which has been widely used in marketing for several different commercial applications: new product design, consumer behavior studies, pricing decisions, sales training, and others (Cattin, 1982; Winnick, 1989). Unfortunately, the conjoint analysis technique has received very little attention in the education literature. There have been applications of the conjoint procedure to curriculum development (Sparling, 1977), student's university choice processes (Hooley, 1981), library services preferences (Ramsing, 1982), faculty preferences for collective bargaining (Shukla, 1990), and course design (Zufryden, 1983).

Application of Conjoint Methods to Testing Design

As identified by authors over a number of years, there are concerns about the accuracy of student knowledge as assessed by conventionally designed and scored standardized student tests (Coombs, 1956;Bruno, 1985). It has been demonstrated through empirical studies that testing may not represent true knowledge due to biases introduced from guessing, wording of options provided for re-

sponses, constrained choices for response, and right or wrong scoring without the possibility of partial credit (Bruno, 1989). Given the inaccuracies possible with such designed tests, researchers have examined the costs and benefits of testing (Catterall, 1982;Catterall, 1988). Catterall identified and explored the direct and indirect monetary costs as well as the opportunity and psychological costs of testing in an inner city and suburban elementary school (Catterall, 1982). As a result of the deficiencies found with conventional forced choice or binary type (right-wrong) test scoring methods, alternate designs have been developed and applied to actual student populations. One newer approach is the modified confidence weighted-admissible probability measurement (MCW-APM) test scoring method developed by Bruno (Bruno, 1985). The MCW-APM approach overcomes some of the problems found with present test design and scoring approaches. Since resistance may be expected from major changes in testing design and scoring from test administrators and test takers, it would be helpful to know the preferences of respondents who have been presented alternate format exams.

To test the applicability of conjoint to this important area of concern in educational administration, alternate conjoint designs were developed and results presented for a large data set. The conjoint design was developed with four factors, and responses were received from 607 individuals. The testing illustration displays conjoint's ability to incorporate analysis of age, grade level, test subject area, and ethnic background of the respondent in the interpretation of results. To further test the applicability of the approach, the design was later modified to include five factors and an analysis was performed on the number of additional questions required.

Table 1 displays the four attributes and levels included in the initial analysis. These factors were identified from the literature on testing as important factors in test design (Bruno, 1989). Six pairwise designed questions were

presented to respondents for the four factors considered. The survey questionnaire also solicited self-explicated respondent views for the four attributes. The coding and computation was similar to that identified in the Shukla study (1990).

Responses were received from 607 students representing different levels of education and different colleges and universities. After elimination of responses which were incomplete and those which were identified by the researcher as incorrectly entered in data transfer from paper to disk, a total of 516 usable responses resulted. It is believed by the researcher that the majority of responses eliminated from the analysis represented errors in keyboard entry by prior individuals rather than difficulty by respondents in responding to the survey questions. As the complete survey consisted of 44 questions, the number of incomplete responses are viewed as possibly representing difficulty respondents had with the length of the survey and not difficulty with conjoint's task complexity.

Table 2 displays the aggregate results of attribute importance based upon the conjoint derived importance weights. The relative ranking of the attributes, by preference, was feedback first, partial credit second, restrictions third, and objectivity fourth. These relative rankings were consistent with the rankings of the attributes based upon self-explicated preferences identified. Tables 3 and 4 identify the preference results based upon grade level and age, respectively. The two figures display a strong correlation, as one would expect, between preferences derived from analysis of grade level and age. The interpretation of results suggests that as the grade level and age increase, the preference for feedback increases, and the preferences for no restrictions and objectivity decrease. Table 5 displays results based upon subject area for the examination. The results indicate that feedback has a higher importance in quantitative subject areas such as mathematics, science, and economics and has lesser importance in verbal areas such as language and reading. Table 6 displays results based upon ethnic background. From the results, it appears, that relative to other ethnic groups, by

attribute, the following conclusions could be presented: for feedback, Asian respondents had the highest importance weights and Hispanic respondents the least; for partial credit, Asian and White respondents had higher importance weights, and Hispanic and Black respondents with less importance weights; for no restrictions on choices, Asian respondents had higher importance weights and White respondents lesser importance weights; and for objectivity, Hispanic and Black respondents had higher importance weights and Asian respondents had lesser importance weight. Based upon these results and examination of differences among groups based upon age, grade, subject area, and ethnic background additional information is gained relative to just an aggregate analysis.

To further assess the applicability of conjoint, the study design was modified to consider the impact on the conjoint respondent task if a fifth factor was added. A fifth factor of test responding simplicity (need instructions on how to use answer sheet or no instructions required) was added to analyze the impact upon the number of questions required for completion by respondents. Originally with four factors, each at two level, six pairwise conjoint questions were required; with the fifth factor, also at two levels, a total of ten pairwise questions were required. This analysis illustrates conjoint's flexibility in permitting alternate designs.

The testing design illustration displays that conjoint could be utilized for larger size samples and permits analysis by demographic factors. The illustration helps to show conjoint's applicability to education.

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Table 1

Testing Design Preference Attributes and Levels

Attributes	Levels
Objectivity	subjective objective
Restrictions	restricted unrestricted
Partial Credit	allowed not allowed
Feedback	given not given

Table 2

Aggregate Preferences for Testing Design

Attribute	% Importance
Objectivity	22.9%
Restrictions	23.3%
Partial Credit	26.0%
Feedback	27.6%

Table 3

Preferences for Testing Design by Grade

Attribute	8-10th	11th-12th	CommColl	University
Objectivity	23.9%	23.7%	24.4%	21.9%
Restrictions	23.0%	24.3%	23.2%	23.0%
Partial Credit	26.5%	25.9%	24.8%	26.4%
Feedback	26.4%	25.9%	27.4%	28.5%

Table 4

Preferences for Testing Design by Age

Attribute	11-13	14-18	19-25	26+
Objectivity	24.0%	24.0%	21.8%	22.4%
Restrictions	22.2%	23.7%	23.4%	22.5%
Partial Credit	24.9%	25.8%	26.5%	25.7%
Feedback	28.6%	26.3%	28.1%	29.2%

Table 5

Preferences for Testing by Subject

Attribute	Math	Science	Language	Economics	Reading	Athl.Battery
Objectivity	24.5%	24.0%	24.0%	22.2%	23.8%	24.3%
Restrictions	21.9%	19.7%	24.5%	25.5%	24.4%	23.5%
Partial Credit	26.3%	27.1%	27.1%	23.3%	27.2%	25.5%
Feedback	27.0%	29.0%	24.2%	28.8%	24.4%	26.4%

Table 6

Preferences for Testing by Ethnicity

Attribute	White	Black	Hispanic	Asian
Objectivity	22.6%	23.5%	23.8%	21.5%
Restrictions	23.1%	23.5%	23.7%	24.0%
Partial Credit	26.3%	25.7%	25.2%	26.2%
Feedback	27.7%	27.1%	27.0%	28.2%